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SIEMENS CORPORATION
INTELLECTUAL PROPERTY DEPARTMENT
170 WOOD AVENUE SOUTH
ISELIN, NJ 08830

EXAMINER	
ANDERSON, DENISE R	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/599,350	ZUBACK, JOSEPH EDWARD	
	Examiner	Art Unit	
	Denise R. Anderson	1709	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☒ Claim(s) *7-9,15-16,19-23,25,30,34* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 September 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Claim Objections

1. Claims 7 and 8 are objected to because of the following informality: Claim 7 and 8 both recite "insoluble impurities" and no mention is made of "insoluble impurities" in any claim upon which claims 7 or 8 depend. However, both claims depend on claim 1 – which recites "a filterable impurity." The examiner will assume claims 7 and 8 recite "the filterable impurities." Appropriate correction is required.

2. Claim 8 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 8 recites that the filterable impurities of claim 1 include "organic matter, inorganic matter, particulate matter, biological matter and non-biological matter." All filterable impurities of claim 1 fall into at least one of these categories. Thus, claim 8 fails to further limit claim 1.

3. Claim 9 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 9 recites that the dissolved impurities of claim 1 include "dissolved, soluble or solubilized organic or inorganic matter." All dissolved impurities of claim 1 fall into at least one of these categories. Thus, claim 9 fails to further limit claim 1.

4. Claim 15 is objected to because of the following informality: the word "electropreciptiation" should be spelled "electroprecipitation." Appropriate correction is required.

5. Claim 16 is objected to because of the following informality: the claim recites "the residual reverse osmosis feed" but there is no mention made of a "residual reverse osmosis feed" in claim 1. However, there is a residual reverse osmosis stream in claim 1. The examiner will assume claim 16 recites "the residual reverse osmosis stream." Appropriate action is required.

6. Claim 19 is objected to because of the following informality: The claim recites "the reverse osmosis reject" but there is no mention made of "the reverse osmosis reject" in claims 1 or 17-18 upon which claim 19 depends. However, there is a residual reverse osmosis stream in claim 1. The examiner will assume claim 19 recites "the residual osmosis stream." Appropriate action is required.

7. Claim 20 is objected to because of the following informality: The claim is poorly written. The claim appears in italics below with the examiner's interpretation following. Appropriate action is required.

Claim 20. A method of purifying impure water, the method comprising the steps of:

providing

a primary microfiltration unit,

a reverse osmosis unit in downstream fluid communication from said primary microfiltration or ultrafiltration unit, and

a controllable fluid pathway for directing residual reverse osmosis feed to backwash said microfiltration unit; and

wherein the residual reverse osmosis feed is further subjected to ultrafiltration or microfiltration by a secondary ultrafiltration or microfiltration unit prior to a step of backwashing the primary ultrafiltration or microfiltration membrane.

In the patentability analysis, the examiner will assume the method of purifying impure water is:

Step 1. Provide a primary microfiltration unit, a reverse osmosis unit, and a control system to direct a residual reverse osmosis stream from the reverse osmosis unit to the microfiltration unit to backwash it.

Step 2: Put the residual reverse osmosis stream through a secondary ultrafiltration or microfiltration unit.

Step 3: Backwash the primary ultrafiltration of microfiltration unit with the residual reverse osmosis stream.

8. Claims 21-23 are objected to because of the following informality: Claims 21-23 recite "the reverse osmosis reject" but there is no mention made of "the reverse osmosis reject" in claim 20 upon which these claims depend. However, there is a "residual reverse osmosis feed" in claim 20. The examiner will assume claims 21-23 recites "the residual reverse osmosis feed." For claim interpretation purposes, the examiner will assume the "residual reverse osmosis feed" is the same as the "residual reverse osmosis stream" in the other independent claims. Appropriate action is required.

9. Claim 25 is objected to because of the following informality: The claim recites "said reverse osmosis in downstream fluid communication from said primary microfiltration or ultrafiltration unit" and should read "said reverse osmosis unit in downstream fluid communication from said primary microfiltration or ultrafiltration unit." Appropriate action is required.

10. Claim 30 is objected to because of the following informality: The claim recites a limitation of "a controllable fluid pathway to transfer impure filtered water comprising a dissolved impurity from the primary microfiltration or ultrafiltration unit to the reverse osmosis unit". The word "comprising" is confusing in this context. The suggestion is to change the wording to match that of claim 25, upon which claim 30 depends. The claim 30 limitation would then read "a controllable fluid pathway to transfer impure filtered water contaminated with a dissolved impurity from the primary microfiltration or ultrafiltration unit to the reverse osmosis unit". Appropriate action is required.

11. Claim 34 is objected to because of the following informality: The claim recites "the reverse osmosis reject" but there is no mention made of "the reverse osmosis reject" in claim 25 upon which claim 34 depends. However, there is a residual reverse osmosis stream in claim 25. The examiner will assume claim 34 recites "the residual reverse osmosis stream." Appropriate action is required.

Claim Rejections - 35 USC § 112

12. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

13. Claim 21 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 21 recites "a suspended solids content of less than a predetermined quantity" but there is no way to determine what the "predetermined quantity" is in the specification or original claims.

14. Claim 22 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 22 recites "a suspended solids content sufficient to allow it to be returned to the impure water source" but there is no way to determine what "sufficient" means in the specification or original claims.

15. Claim 23 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 23 recites "a suspended solids content sufficient to allow it to be returned to the ocean" but there is no way to determine what "sufficient" means in the specification or original claims.

16. Claim 24 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

> *Claim 24. A method according to claim 21 wherein the suspended solids content is controlled by controlling desalination recovery rate.*

According to the specification and the figure, the solids come in with the impure water and are essentially all removed with the primary microfiltration unit. The solids-free

impure water then goes into the reverse osmosis unit where the desalination occurs. From the specification, it is unclear how the undefined "desalination recovery rate" controls the suspended solids content.

17. Claim 29 recites the limitation "Apparatus according claim 25 wherein the chemical agents are . . ." in line 1. There is insufficient antecedent basis for this limitation in the claim. In the patentability analysis below, the examiner will assume that claim 29 depends on claim 28.

Claim Rejections - 35 USC § 102

18. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

19. Claims 1-2, 6-10, 17 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Daly et al. (Patent No. 6,120,688, Sept. 19, 2000). The claims appear below in italics with the prior art and examiner's comments in normal font.

Claim 1. A method of purifying impure water (Daly et al., Abstract, line 1; Figure) *contaminated with a filterable impurity and a dissolved impurity, the method comprising the steps of:*

providing impure water (Daly et al., Figure, reference number 8) *to a primary microfiltration or ultrafiltration unit* (Daly et al., Figure, reference number 20) *to remove the filterable impurity and produce impure filtered water*

contaminated with a dissolved impurity (Daly et al., Figure, water is introduced to the ultrafiltration unit through the line labeled "11" using a feed pump and a raw water pump; Column 4, lines 11-14)*;*

providing the impure filtered water contaminated with a dissolved impurity to a reverse osmosis unit (Daly et al., Figure, reference part 70) *to produce a potable water stream* (Daly et al., Figure, reference number 76; Column 6, lines 38-40) *and a residual reverse osmosis stream* (Daly et al., Figure, reference number 82) (Daly et al., Figure, impure filtered water is provided through lines 26, 35, 36, 37, 52, and 62 using process pumps 50 and 60; column 6, lines 28-38)*; and*

treating the residual reverse osmosis stream by being passed through a secondary filter (Daly et al., Figure, reference number 86) *prior to reuse to backwash the microfiltration or ultrafiltration unit* (Daly et al., Figure, the residual reverse osmosis stream enters the secondary filter via the line labeled "82" and exits as either potable water in the line labeled "92" or via the line labeled "94" to be stored in the CIP tank for reuse as backwash; Column 6, lines 48-67).

In summary, Daly et al. anticipates claim 1.

Claim 2. A method according to claim 1 wherein the secondary filter is a microfiltration or ultrafiltration membrane.

Daly et al. discloses all claim 1 limitations and further teaches that during backflushing of the primary microfiltration or ultrafiltration unit (the tubular membranes), the CIP tank also supplies the residual reverse osmosis stream (reverse osmosis retenate) to the reverse osmosis units (reverse osmosis modules) through the 10-micron filter (microfiltration membrane) labeled "54." Daly et al., Figure; Column 7, lines 24-28. During backflushing of the primary microfiltration or ultrafiltration unit, the microfiltration membrane labeled "54" serves as the secondary filter. In summary, Daly et al., discloses all claim 2 limitations.

Claim 6. A method according to claim 1 wherein the impure water is sea water.

Daly et al. teaches all claim 1 limitations and further teaches that the "impure water source can include diverse water sources, including sea water." Daly et al., Column 3, lines 33-34. In summary, Daly et al. anticipates claim 6.

Claim 7. A method according to claim 1 wherein the insoluble impurities include those typically found in sea water.

Because "the insoluble impurities" lack an antecedent basis, the examiner will assume claim 7 recites "the filterable impurities" which have an antecedent basis in claim 1.

Daly et al. teaches all claim 1 limitations and further teaches that the "impure water source can include diverse water sources, including sea water." Daly et

al., Column 3, lines 33-34. Sea water includes "filterable impurities typically found in sea water." In summary Daly et al. anticipates claim 7.

Claim 8. A method according to claim 1 wherein the insoluble impurities include organic matter, inorganic matter, particulate matter, biological matter and non-biological matter.

Because "the insoluble impurities" lack an antecedent basis, the examiner will assume claim 8 recites "the filterable impurities" which have an antecedent basis in claim 1.

Daly et al. teaches all claim 1 limitations. All filterable impurities of claim 1 are either "organic matter, inorganic matter, particulate matter, biological matter, or non-biological matter." In summary, Daly et al. anticipates claim 8.

Claim 9. A method according to claim 1 wherein the dissolved impurities include dissolved, soluble or solubilized organic or inorganic matter.

Daly et al. teaches all claim 1 limitations. All dissolved impurities of claim 1 are either "organic or inorganic" matter. In summary, Daly et al. anticipates claim 9.

Claim 10. A method according to claim 9 wherein the dissolved impurities include sodium ions and chloride ions.

Daly et al. discloses all claim 9 limitations and further teaches that the "impure water source can include diverse water sources, including sea water." Daly et al., Column 3, lines 33-34. Sea water inherently contains sodium ions and chloride ions. For example, Wikipedia (http://en.wikipedia.org/wiki/Seawater, first paragraph of page 1, July 15, 2007) teaches that it is known that sea water has approximately 3.5% (by weight) of dissolved salts, mostly the ions of sodium chloride, i.e. sodium ions and chloride ions. In summary, Daly et al. anticipates claim 10.

Claim 17. A method according to claim 1 wherein the secondary filter comprises multiple stages of filtration.

Daly et al. discloses all claim 1 limitations and further teaches a secondary filter with multiple stages of filtration. Daly et al., Column 1, lines 16-24; Column 1, lines 40-43.

Claim 20. A method of purifying impure water (Daly et al., Figure, reference number 8)*, the method comprising the steps of:*

providing

a primary microfiltration unit (Daly et al., Figure reference number 20),

a reverse osmosis unit (Daly et al., Figure, reference number 70) *in downstream fluid communication from said primary microfiltration or ultrafiltration unit, and*

a controllable (Daly et al., Figure, Column 6, line 66 through Column 7, line 16) *fluid pathway for directing residual reverse osmosis feed to backwash said microfiltration unit; and*

wherein the residual reverse osmosis feed (Daly et al., Figure, reference numbers 82 and 94) *is further subjected to ultrafiltration or microfiltration by a secondary ultrafiltration or microfiltration unit* (Daly et al., Figure, reference number 86)

prior to a step of backwashing (Daly et al., Figure, Column 6, line 66 through Column 7, line 16) *the primary ultrafiltration or microfiltration membrane.*

In the patentability analysis, the examiner will assume the method of purifying impure water is:

Step 1. Provide a primary microfiltration unit, a reverse osmosis unit, and a control system to direct a residual reverse osmosis stream from the reverse osmosis unit to backwash the microfiltration unit.

Step 2: Put the residual reverse osmosis stream through a secondary ultrafiltration or microfiltration unit.

Step 3: Backwash the primary ultrafiltration of microfiltration unit with the residual reverse osmosis stream.

Daley et al. teaches all of the above steps and, therefore, anticipates claim 20.

Claim Rejections - 35 USC § 103

20. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

21. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

22. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Daly et al. (Patent No. 6,120,688, Sept. 19, 2000) as applied to claim 1 above. The claim appears below in italics with the examiner's comments in normal font.

Claim 3. A method according to claim 2 wherein the secondary filter is backwashed.

Daly et al. discloses all claim 2 limitations and further teaches that the primary microfiltration or ultrafiltration units are backwashed to clean them. Daly et al., Figure, Column 7, lines 13-15. Daly et al. does not expressly disclose backwashing the secondary filter that appears as reference number 54 in the figure and is labeled "10 Micron Filter." It would have been obvious to one having ordinary skill in the art at the time the invention was made to backwash

the secondary filter as needed, as taught by Daly for the primary microfiltration or ultrafiltration units, since such a modification would clean the secondary filter.

23. Claims 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Daly et al. (Patent No. 6,120,688, Sept. 19, 2000) as applied to claim 1 above, and further in view of Marius et al. (Patent No. 5,059,317, Oct. 22, 1991). The claims appear below in italics with the examiner's comments in normal font.

Claim 4. A method according to claim 1 wherein the secondary filter is a cartridge filter.

Daly et al. discloses the claimed invention except for the cartridge filter as a secondary filter. Marius et al. teaches that it is known to provide containers with ion-exchange resins, i.e., cartridge filters, to serve as secondary filters after "micro filtration and reverse osmosis". Marius et al., Column 3, lines 32-38; Figure 1. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a cartridge filter with an ion exchange resin as taught by Marius et al., since Marius et al. states at Column 3, lines 32-38 that such a modification would provide drinking water if the waste water contained dissolved radionucleides could not be made potable with microfiltration and reverse osmosis alone.

In summary, Daly et al., in view of Marius et al., discloses all claim 4 limitations.

Claim 5. A method according to claim 4 wherein the secondary filter is backwashed.

Daly et al. discloses the claimed invention except that the cartridge filter is backwashed. Marius et al. teaches that it is known to backwash a cartridge filter containing ion exchange resins after the ion exchange resins are exhausted. Marius et al. teaches that two cartridge filters with ion exchange resins are piped in parallel so that at least one filter "with unexhausted resinous material, is always placed in the liquid stream." The ion exchange resin rejuvenation cycle is then described, i.e. how the secondary filter is backwashed is then described. Marius et al., Column 3, lines 38-49; Figure 1. It would have been obvious to one having ordinary skill in the art at the time the invention was made to backwash the secondary filter (the cartridge filter containing ion exchange resins) to rejuvenate the ion exchange resin as taught by Marius et al. since Marius et al. states at Column 3 lines 49 that such a modification would ensure "all of the dissolved inorganic salts are filtered" from the water.

In summary, Daly et al., in view of Marius et al., discloses all claim 5 limitations.

24. Claims 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Daly et al. (Patent No. 6,120,688, Sept. 19, 2000) as applied to claim 1 above, and further in view of Water Encyclopedia (Jay Lehr, editor, John Wiley & Sons, Inc., New York, 2005). Applicant wishes to further treat a water stream, specifically the residual

reverse osmosis stream prior to reuse. Water treatment is an old science, as evidenced by the five volumes in the Water Encyclopedia. The approach taken to the patentability analysis below is that Daly et al disclosed the method of claim 1 and the various chemical treatments, radiation treatments, and physical treatments are taught in the Water Encyclopedia to further purify or enhance the residual reverse osmosis stream prior to reuse. It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply needed treatments to the residual reverse osmosis stream, as taught by the Water Encyclopedia, because such modifications would further purify or enhance the residual reverse osmosis stream prior to reuse.

Claim 11. A method according to claim 1 wherein the residual reverse osmosis stream is treated prior to being reused by one or more of chemical treatment, radiation treatment or physical treatment.

Daly et al. teaches all claim 1 limitations but does not teach a specific chemical treatment like chlorination, or a radiation treatment like UV, or a physical treatment like ultasonication. The Water Encyclopedia teaches all three treatments as methods to enhance or purify water.

The Water Encyclopedia teaches a chemical treatment. One such chemical treatment is chlorination where "chlorine is added to water to kill disease-causing bacteria, parasites, and other organisms." Water Encyclopedia, Chlorination, 2:88, Introduction, ¶ 1.

The Water Encyclopedia teaches a radiation treatment. One such radiation treatment is UV light that is used as "a reliable means of disinfection." Water Encyclopedia, Ultraviolet Disinfection, 1:466, What is UV Disinfection? ¶ 1.

Finally, the Water Encyclopedia teaches a physical treatment to purify water – namely ultrasonication or ultrasonic irradiation. In this treatment, water is irradiated with ultrasonic waves that heat up small water pockets to the point of vaporization. This is known as "cavitation" which "may function as a microreactor" to either destroy "volatile organic compounds inside" or serve as a "H*, OH*, OOH* radical source that may react with pollutants in the bulk of solution." Water Encyclopedia, Waste Treatment Techniques – Advanced, 1:875, Ultrasonic Irradiation, ¶ 1 and Figure 7.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to treat the residual reverse osmosis stream, if needed, by one or more chemical treatments, radiation treatments, or physical treatments as taught by the Water Encyclopedia because such a modification would either enhance or purify the water before reuse.

In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 11 limitations.

Claim 12. A method according to claim 11 wherein the chemical treatment is chlorination, fluorination, disinfection, scale control treatment, water softening, peroxide, sulfite/bisulfite, ozone or mixtures thereof.

Daly et al., in view of the Water Encyclopedia, teaches all claim 11 limitations. The Water Encyclopedia further teaches:

Chlorination where "chlorine is added to water to kill disease-causing bacteria, parasites, and other organisms." Water Encyclopedia, Chlorination, 2:88, Introduction, ¶ 1.

Fluoridation where fluoride is added to community water supplies to prevent tooth decay. Water Encyclopedia, Fluoridation, 1:254, ¶ 1.

Scale control treatment where chemicals are added to solubilize calcium carbonate $CaCO_3$ and prevent it from scaling out on equipment – which causes equipment operating problems. Water Encyclopedia, Industrial Cooling Water – Scale Formation, 1:547-548, Scaling Control, ¶ 1.

Water softening where either hydrated lime [$Ca(OH)_2$] or quicklime (CaO) are added to the water to improve the quality for domestic use, i.e. reduce scale in water heaters or allow soap to lather well. Water Encyclopedia, Lime Softening, 1:322, ¶ 1.

Peroxide as an alternative disinfection method to chlorination. Water Encyclopedia, Threat Agent and Water Biosecurity, 1:88, Survival of Threat Agents in Water, last paragraph.

Sulfite / bisulfate for the dechlorination of water. Water Encyclopedia, Dechlorination, 1:169, ¶ 2.

Ozone as a "powerful oxidizing and disinfecting agent" and as one of the treatment "technologies for small drinking water systems." Water

Encyclopedia, Treatment for Technologies for Small Drinking Water Systems, 1:458, paragraph entitled "Ozonation."

It would have been obvious to one having ordinary skill in the art at the time the invention was made to treat the residual reverse osmosis stream, if needed, by one or more chemical treatments from the list of chlorination, fluorination, disinfection, scale control treatment, water softening, peroxide, sulfite/bisulfite, or ozone, as taught by the Water Encyclopedia, because such modifications would enhance the water before reuse.

In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 12 limitations.

Claim 13. A method according to claim 11 wherein the radiation treatment is UV, IR, microwave or mixtures thereof.

Daly et al., in view of the Water Encyclopedia, teaches all claim 11 limitations. The Water Encyclopedia further teaches:

UV irradiation as "a reliable means of disinfection." Water Encyclopedia, Ultraviolet Disinfection, 1:466, What is UV Disinfection? ¶ 1.

Heat can be used to purify water via vaporization. Water Encyclopedia, Wasterwater Treatment and Recycling Technologies, 1:813, Thermal Technologies - Distillation, ¶ 1. Both IR and microwave irradiation can serve as heat sources.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to treat the residual reverse osmosis stream, if needed, by one or more radiation treatments from the list of UV, IR and microwave, as taught by the Water Encyclopedia, because such modifications would enhance the water or purify it before reuse.

In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 13 limitations.

Claim 14. A method according to claim 11 wherein the physical treatment is ultrasonication or vortexing.

Daly et al., in view of the Water Encyclopedia, teaches all claim 11 limitations. The Water Encyclopedia further teaches:

Ultrasonication where water is irradiated with ultrasonic waves that heat up small water pockets to the point of vaporization. This is known as "cavitation" which "may function as a microreactor" to either destroy "volatile organic compounds inside" or serve as a "H*, OH*, OOH* radical source that may react with pollutants in the bulk of solution." Water Encyclopedia, Wastewater Treatment Techniques – Advanced, 1:875, Ultrasonic Irradiation, ¶ 1 and Figure 7.

Vortexing where solids are separated from sewage water. Water Encyclopedia, Combined Sewer Overflow Treatment, 1:784, Physical Treatment – Swirl/Vortex Technologies, ¶ 1, Figure 3.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to treat the residual reverse osmosis stream, if needed, by one or more physical treatments from the list of ultrasonication or vortexing, as taught by the Water Encyclopedia, because such modifications would enhance or purify the water before reuse.

In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 14 limitations.

Claim 15. A method according to claim 11 wherein the reverse osmosis stream is treated by heat, electropreciptiation, magnetic treatments or combinations thereof.

Daly et al., in view of the Water Encyclopedia, teaches all claim 11 limitations. The Water Encyclopedia further teaches that:

> Heat can be used to purify water via distillation. Water Encyclopedia, Wasterwater Treatment and Recycling Technologies, 1:813, Thermal Technologies – Distillation, ¶ 1.

> Electroprecipitation (electrolysis) can be used to deposit or decompose soluble inorganics or organics on to an electrode surface by an electrochemical redox reaction. Water Encyclopedia, Wastewater Treatment and Recycling Technologies, 1:812, Electrical Technologies – Electrolysis, ¶ 1.

Magnetic treatments can be used to control hard water scale. Water Encyclopedia, Physical Water Conditioning, 1:141, ¶ 1.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to treat the residual reverse osmosis stream, if needed, by one or more treatments from the list of heat, electroprecipitation, or magnetic treatments, as taught by the Water Encyclopedia, because such modifications would enhance or purify the water before reuse.

In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 15 limitations.

25. Claims 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Daly et al. (Patent No. 6,120,688, Sept. 19, 2000) as applied to claims 1 and 17 above. The claims appear below in italics and the prior art and examiner's comments are in normal font.

Claim 16. A method according to claim 1 wherein the residual reverse osmosis feed is used to backwash the primary microfiltration or ultrafiltration unit and is subject to ultrafiltration or microfiltration by a secondary ultrafiltration or microfiltration unit prior to said backwashing.

Because "the residual reverse osmosis feed" lacks an antecedent basis, the examiner will assume claim 16 recites "the residual reverse osmosis stream" which has an antecedent basis in claim 1.

Daly et al. discloses all claim 1 limitations. Claim 16 is interpreted to recite a secondary ultrafiltration or microfiltration unit (secondary filtration unit) between the CIP and the primary ultrafiltration or microfiltration unit (primary filtration unit) during the backwash of the primary filtration unit.

Daly et al. does not expressly state that there is a secondary filtration unit between the CIP tank and the primary filtration unit. However, Daly et al. does teach that during the backwashing (backflushing) of the primary filtration unit (the tubular membranes), the CIP tank also supplies the residual reverse osmosis stream (reverse osmosis retenate) to the reverse osmosis units (reverse osmosis modules) through a 10-micron filter (microfiltration membrane) labeled "54." Daly et al., Figure; Column 7, lines 24-28. The 10-micron filter removes any particulate matter coming in with the residual reverse osmosis stream from the CIP tank and related piping. It would have been obvious to one having ordinary skill in the art at the time the invention was made to place a microfiltration unit between the CIP tank and the primary filtration unit, as taught by Daly et al. for between the CIP tank and the reverse osmosis unit, because such a modification would remove what little particulate matter still exists in the residual reverse osmosis stream from the CIP tank and related piping.

In summary then, Daly et al. discloses all claim 16 limitations.

Claim 18. A method according to claim 17 wherein the multiple stages of filtration include a first filtration through a coarse filter prior to filtration through a membrane filter.

Daly et al. discloses all claim 17 limitations. Daly et al. further teaches the presence of a course filter but does not expressly teach a course filter as part of a secondary filter prior to the "reverse osmosis ('RO') modules". Daly et al, Column 1, lines 25-38. It would have been obvious to one having ordinary skill in the art at the time the invention was made to place a course filter prior to any membrane filter, including the remaining secondary filter stages, as taught by Daly et al. because such a modification would remove particulate matter that could clog the downstream membrane filter.

In summary then, Daly et al. discloses all claim 18 limitations.

26. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Daly et al. (Patent No. 6,120,688, Sept. 19, 2000) as applied to claim 1 above, and further in view of Water Encyclopedia (Jay Lehr, editor, John Wiley & Sons, Inc., New York, 2005). The claim appears below in italics with the prior art and the examiner's comments in normal font.

Claim 19. A method according to claim 18 wherein the reverse osmosis reject is in controllable fluid communication with coarse backwashable filters such as single or multimedia filters, disc filters, diatomaceous earth filters, membrane filters, strainers, or screens.

Because "the reverse osmosis reject" lacks an antecedent basis, the examiner will assume claim 19 recites "the residual reverse osmosis stream" which has an antecedent basis in claim 1.

Daly et al. discloses all claim 18 limitations including that the residual reverse osmosis stream is in controllable fluid communication with backwashable filters. Daly et al., Figure, Column 6, line 66 through Column 7, line 16. Daly et al. further discloses strainers. Daly et al., Figure, reference number 6; Column 3, lines 53-55. The Water Encyclopedia also discloses backwashable filters and further teaches single or multimedia filters, disk filters, diatomaceous earth filters, membrane filters, and screens.

Backwashable filters are used so that they can be cleaned and, thus, filtrate quality is maintained. Water Encyclopedia, Filtration Water Treatment, 1:245-246, first two paragraphs of the article.

Single or multimedia filters are used to produce clear water and to improve taste and reduce odor: Water Encyclopedia, Filtration Water Treatment, 1:245-246, first paragraph of the article and sixth paragraph of the article.

Disk filters such as are used to aerate water. These filters are often sintered ceramic plates: Water Encyclopedia, Fine Bubble Diffused Air Aeration Systems, 1:626, Figure 4 and the third paragraph of the article.

Diatomaceous earth filters are used to remove particles in the water: Water Encyclopedia, Filtration Water Treatment, 1:247, third paragraph on the page beginning with "Diatomaceous earth filtration."

Membrane filters are used to produce potable water from seawater or brackish water: Water Encyclopedia, Filtration Water Treatment, 1:247, fourth paragraph on the page beginning with "Membrane filtration."

Strainers: Daly et al., Figure, reference number 6.

Screens are used to remove solids from wastewater. Water Encyclopedia, Wastewater Treatment and Recycling Technologies, 1:809, paragraph following the title "Screening, Filtration, and Centrifugal Separation."

It would have been obvious to one having ordinary skill in the art at the time the invention was made to match the Daly et al. method with the correct filter alternative listed in the claim and taught by the Water Encyclopedia, because such a modification would achieve the design objectives for the particular situation at hand.

In summary then, Daly et al., in view of the Water Encyclopedia, discloses all claim 19 limitations.

27. Claims 25-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Daly et al. (Patent No. 6,120,688, Sept. 19, 2000) and further in view of Water Encyclopedia (Jay Lehr, editor, John Wiley & Sons, Inc., New York, 2005). Applicant wishes to further treat a water stream, specifically the residual reverse osmosis stream prior to reuse. Water treatment is an old science, as evidenced by the five volumes in the Water Encyclopedia. The approach taken to the patentability analysis will be the same as that done for claims 11-15. Daly et al. disclosed the apparatus of claim 25 and

the various chemical treatments, radiation treatments, and physical treatments are taught in the Water Encyclopedia to further purify or enhance the residual reverse osmosis stream prior to reuse. It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply needed treatments to the residual reverse osmosis stream, as taught by the Water Encyclopedia, because such modifications would further purify or enhance the residual reverse osmosis stream prior to reuse. The claims appear below in italics with the prior art and the examiner's comments in normal font.

Claim 25. Apparatus (Daly et al., Figure) *for purifying impure water* (Daly et al., Abstract, line 1) contaminated *with a filterable impurity and a dissolved impurity, the apparatus comprising:*

a primary microfiltration or ultrafiltration unit (Daly et al., Figure, reference number 20) *to remove the filterable impurity;*

a reverse osmosis unit (Daly et al., Figure, reference number 70) *to produce a potable water stream and a residual reverse osmosis stream* (Daly et al., Figure, reference numbers 82 ad 94);

said reverse osmosis in downstream fluid communication from said primary microfiltration or ultrafiltration unit (Daly et al., Figure, impure filtered water is provided through lines 26, 35, 36, 37, 52, and 62 using process pumps 50 and 60; Column 6, lines 28-38);

a controllable fluid pathway to transfer impure filtered water contaminated with a dissolved impurity from the primary microfiltration or ultrafiltration unit to the reverse osmosis unit; and

means for treating the residual reverse osmosis stream prior to reuse.

Daly et al expressly discloses claim 25 except for two limitations. The first limitation is "the controllable fluid pathway" to transfer impure filtered water from the primary microfiltration or ultrafiltration unit to the reverse osmosis unit. Daly et al. expressly describes a control system to direct the residual reverse osmosis stream (reverse osmosis retenate) from the CIP tank (reference number 100) to backflush the primary filtration unit (reference number 20). Daly et al., Figure; Column 6, line 66 through Column 7, line 16. This would imply that Daly et al. also controls the flow from the primary filtration unit to the reverse osmosis unit. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a "controllable fluid pathway" from the primary filtration unit to the reverse osmosis unit as was done with the "controllable fluid pathway" from the CIP tank to the primary filtration unit, in order to automate the apparatus.

The second limitation that Daly did not expressly disclose was the means for treating the residual reverse osmosis stream prior to reuse. The patentability analysis for the various "means" follows the same reasoning as claims 11-15 and will not be repeated here. In summary then, Daly et al., in view of the Water Encyclopedia, discloses all claim 25 limitations.

Claim 26. Apparatus according to claim 25 wherein the residual reverse osmosis stream is directed by a controllable fluid pathway to backwash the primary microfiltration or ultrafiltration unit.

Daly et al., in view of the Water Encyclopedia, discloses all claim 25 limitations. Daly et al. further teaches a control system to direct the residual reverse osmosis stream to backwash the primary microfiltration or ultrafiltration unit. Daly et al., Figure; Column 6, line 66 through Column 7, line 16. In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 26 limitations.

Claim 27. Apparatus according to claim 25 wherein the residual reverse osmosis stream is directed by a controllable fluid pathway through a secondary microfiltration or ultrafiltration membrane to backwash the primary microfiltration or ultrafiltration unit.

Daly et al., in view of the Water Encyclopedia, discloses all claim 25 limitations. Daly et al. does not expressly state that there is a secondary microfiltration or ultrafiltration membrane (secondary filtration unit) between the CIP tank and the primary microfiltration or ultrafiltration unit (primary filtration unit). However, Daly et al. does teach that during the backwashing (backflushing) of the primary filtration unit (the tubular membranes), the CIP tank also supplies the residual reverse osmosis stream (reverse osmosis retenate) to

the reverse osmosis units (reverse osmosis modules) through a 10-micron filter (microfiltration membrane) labeled "54." Daly et al., Figure; Column 7, lines 24-28. The 10-micron filter removes any particulate matter coming in with the residual reverse osmosis stream from the CIP tank and related piping. It would have been obvious to one having ordinary skill in the art at the time the invention was made to place a secondary microfiltration unit between the CIP tank and the primary filtration unit, as taught by Daly et al. who placed the secondary microfiltration unit between the CIP tank and the reverse osmosis unit, because such a modification would remove what little particulate matter still exists in the residual reverse osmosis stream from the CIP tank and related piping.

Daly et al. also does not expressly state that there is a control system to direct the residual reverse osmosis stream from the CIP tank, through a secondary filtration unit, to backwash the primary filtration unit. However, Daly et al. does describe a control system that directs the residual reverse osmosis stream from the CIP tank to backwash the primary filtration unit – without a secondary filtration unit. Daly et al., Figure; Column 6, line 66 through Column 7, line 16. This would imply that Daly et al. could control the flow of the residual reverse osmosis stream from the CIP tank, through a secondary filtration unit, to backwash the primary filtration unit. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a "controllable fluid pathway" from the CIP tank, thorough a secondary filtration unit, to the primary filtration for backwashing -- as taught by Daly et al. who

provided a "controllable fluid pathway" from the CIP tank to the primary filtration unit for backwashing – since such a modification would automate the apparatus.

In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 27 limitations.

Claim 28. Apparatus according to claim 25 further including one or any combination of ports for the introduction of chemical agents, irradiation means, ultrasonic generators, vortexing devices, heating elements, electroprecipitators and magnets.

Daly et al., in view of the Water Encyclopedia, discloses all claim 25 limitations. The patentability analysis for the various "ports" follows the same reasoning as for "chemical treatments," "radiation treatments," "ultrasonication," "vortexing," "heat," "electroprecipitation," and "magnetic treatments" in claims 11 and 13-15 and will not be repeated here. In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 28 limitations.

Claim 29. Apparatus according claim 25 wherein the chemical agents are chlorination agents, fluorination agents, ozonation agents, disinfecting agents, scale control treatment agents, water softening agents, peroxide, sulfite/bisulfite.

Because there is no antecedent basis for "the chemical agents" in claim 25, the examiner will assume that claim 29 depends on claim 28. Daly et al., in view of the Water Encyclopedia, discloses all claim 28 limitations. The patentability

analysis for the chemical "agents" follows the same reasoning used for the chemical "treatments" in claims 11-12 and will not be repeated here. In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 29 limitations.

Claim 30. Apparatus according to claim 25 for purifying impure water contaminated with a filterable impurity and a dissolved impurity, the apparatus comprising:

a primary microfiltration or ultrafiltration unit to remove the filterable impurity;

a reverse osmosis unit to produce a potable water stream and a residual reverse osmosis stream;

said reverse osmosis unit in downstream fluid communication from said primary microfiltration or ultrafiltration unit;

a controllable fluid pathway to transfer impure filtered water comprising a dissolved impurity from the primary microfiltration or ultrafiltration unit to the reverse osmosis unit; and

a conduit to transfer a residual reverse osmosis stream from the reverse osmosis unit to

backwash the primary microfiltration or ultrafiltration unit via a secondary microfiltration or ultrafiltration unit.

Daly et al., in view of the Water Encyclopedia, discloses all claim 25 limitations. Claim 30 adds the limitation of a conduit to transfer the residual

reverse osmosis stream from the reverse osmosis unit to backwash the primary microfiltration or ultrafiltration unit (primary filtration unit). Claim 30 also adds the limitation that there is a secondary microfiltration or ultrafiltration unit (secondary filtration unit) within the conduit.

Daly et al. teaches the conduit that runs from the reverse osmosis unit to the primary filtration unit during backwash. Daly et al., Figure, Column 6 line 66 through Column 7, line 16.

Daly et al. does not expressly state that there is a secondary filtration unit within the conduit. Daly et al. does teach that during the backwashing (backflushing) of the primary filtration unit (the tubular membranes), the CIP tank also supplies the residual reverse osmosis stream (reverse osmosis retenate) to the reverse osmosis units (reverse osmosis modules) through a 10-micron filter (microfiltration membrane) labeled "54." Daly et al., Figure; Column 7, lines 24-28. The 10-micron filter removes any particulate matter coming in with the residual reverse osmosis stream from the CIP tank and related piping. It would have been obvious to one having ordinary skill in the art at the time the invention was made to place a microfiltration unit between the CIP tank and the primary filtration unit, as taught by Daly et al. for between the CIP tank and the reverse osmosis unit, because such a modification would remove what little particulate matter still exists in the residual reverse osmosis stream from the CIP tank and related piping.

In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 30 limitations.

Claim 31. Apparatus according to claim 25 wherein the secondary microfiltration or ultrafiltration unit is a backwashable or disposable cartridge microfiltration or ultrafiltration system.

Daly et al., in view of the Water Encyclopedia, discloses all claim 25 limitations. The Water Encyclopedia teaches that "membrane assemblies are contained in pressure vessels or cartridges. Low-pressure membranes in the form of either ultrafiltration (UF) or microfiltration (MF) have become economical in capital costs and have received increased attention in drinking water application." The Water Encyclopedia, Filtration Water Treatment, 1:247, paragraph 4. The Water Encyclopedia also teaches that cartridge filters can use either a "cleanable ceramic" or a "disposable polypropylene" cartridge. Therefore, the Water Encyclopedia teaches that the secondary microfiltration or ultrafiltration unit is a backwashable or disposable cartridge. It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate a backwashable or disposable cartridge as a secondary microfiltration or ultrafiltration unit into the Daly et al. apparatus, as taught by the Water Encyclopedia, since the Water Encyclopedia states at 1:247, paragraph 4, that such a modification is becoming more economical and receiving increased attention in drinking water application.

In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 31 limitations.

Claim 32. Apparatus according to claim 25 wherein the secondary microfiltration or ultrafiltration unit comprises multiple stages of filtration.

Daly et al., in view of the Water Encyclopedia, discloses all claim 25 limitations. Daley et al. further teaches a secondary filter with multiple stages of filtration. Daly et al., Column 1, lines 16-24; Column 1, lines 40-43. In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 32 limitations.

Claim 33. Apparatus according to claim 32 wherein the multiple stages of filtration include a first filtration through a coarse filter prior to filtration through a membrane filter.

Daly et al., in view of the Water Encyclopedia, discloses all claim 32 limitations and the presence of a course filter prior to "reverse osmosis ('RO') modules". Daly et al, Column 1, lines 25-38. It would have been obvious to one having ordinary skill in the art at the time the invention was made to place a course filter prior to any membrane filter, including one stage of a secondary microfiltration or ultrafiltration unit, as taught by Daly et al., because such a modification would remove particulate matter that could clog the downstream membrane filter. In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 33 limitations.

Claim 34. Apparatus according to claim 25 wherein the reverse osmosis reject is in controllable fluid communication with coarse backwashable filters such as single or multimedia filters, disc filters, diatomaceous earth filters, membrane filters, strainers, or screens.

Because "the reverse osmosis reject" lacks an antecedent basis, the examiner will assume claim 34 recites "the residual reverse osmosis stream" which has an antecedent basis in claim 25.

Daly et al., in view of the Water Encyclopedia, discloses all claim 25 limitations including that the residual reverse osmosis stream is in controllable fluid communication with backwashable filters. Daly et al., Figure, Column 6, line 66 through Column 7, line 16. Daly et al. further discloses strainers. Daly et al., Figure, reference number 6; Column 3, lines 53-55. The Water Encyclopedia also discloses backwashable filters and further teaches single or multimedia filters, disk filters, diatomaceous earth filters, membrane filters, and screens.

Backwashable filters are used so that they can be cleaned and, thus, filtrate quality is maintained. Water Encyclopedia, Filtration Water Treatment, 1:245-246, first two paragraphs of the article.

Single or multimedia filters are used to produce clear water and to improve taste and reduce odor: Water Encyclopedia, Filtration Water Treatment, 1:245-246, first paragraph of the article and sixth paragraph of the article.

Disk filters such as are used to aerate water. These filters are often sintered ceramic plates: Water Encyclopedia, Fine Bubble Diffused Air Aeration Systems, 1:626, Figure 4 and the third paragraph of the article.

Diatomaceous earth filters are used to remove particles in the water: Water Encyclopedia, Filtration Water Treatment, 1:247, third paragraph on the page beginning with "Diatomaceous earth filtration."

Membrane filters are used to produce potable water from seawater or brackish water: Water Encyclopedia, Filtration Water Treatment, 1:247, fourth paragraph on the page beginning with "Membrane filtration."

Strainers: Daly et al., Figure, reference number 6.

Screens are used to remove solids from wastewater. Water Encyclopedia, Wastewater Treatment and Recycling Technologies, 1:809, paragraph following the title "Screening, Filtration, and Centrifugal Separation."

It would have been obvious to one having ordinary skill in the art at the time the invention was made to match the Daly et al. method with the correct filter alternative listed in the claim and taught by the Water Encyclopedia, because such a modification would achieve the design objectives for the particular situation at hand.

In summary, Daly et al., in view of the Water Encyclopedia, discloses all claim 34 limitations.

Conclusion

28. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Denise R. Anderson whose telephone number is 571-270-3166. The examiner can normally be reached on Mon-Thurs 7:30-5:30.

29. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter D. Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

30. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Walter D. Griffin

WALTER D. GRIFFIN
SUPERVISORY PATENT EXAMINER

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